Sub-Regional Water Supply and Treatment Analysis Defines Sustainable Water Supply Plan For Three Lower Fox River Watershed Communities

Presented By:

Jeffrey W. Freeman, P.E., CFM, LEED AP
Engineering Enterprises, Inc.

INSTITUTE FOR REGULATORY POLICY STUDIES FALL 2017 CONFERENCE
November 29, 2017

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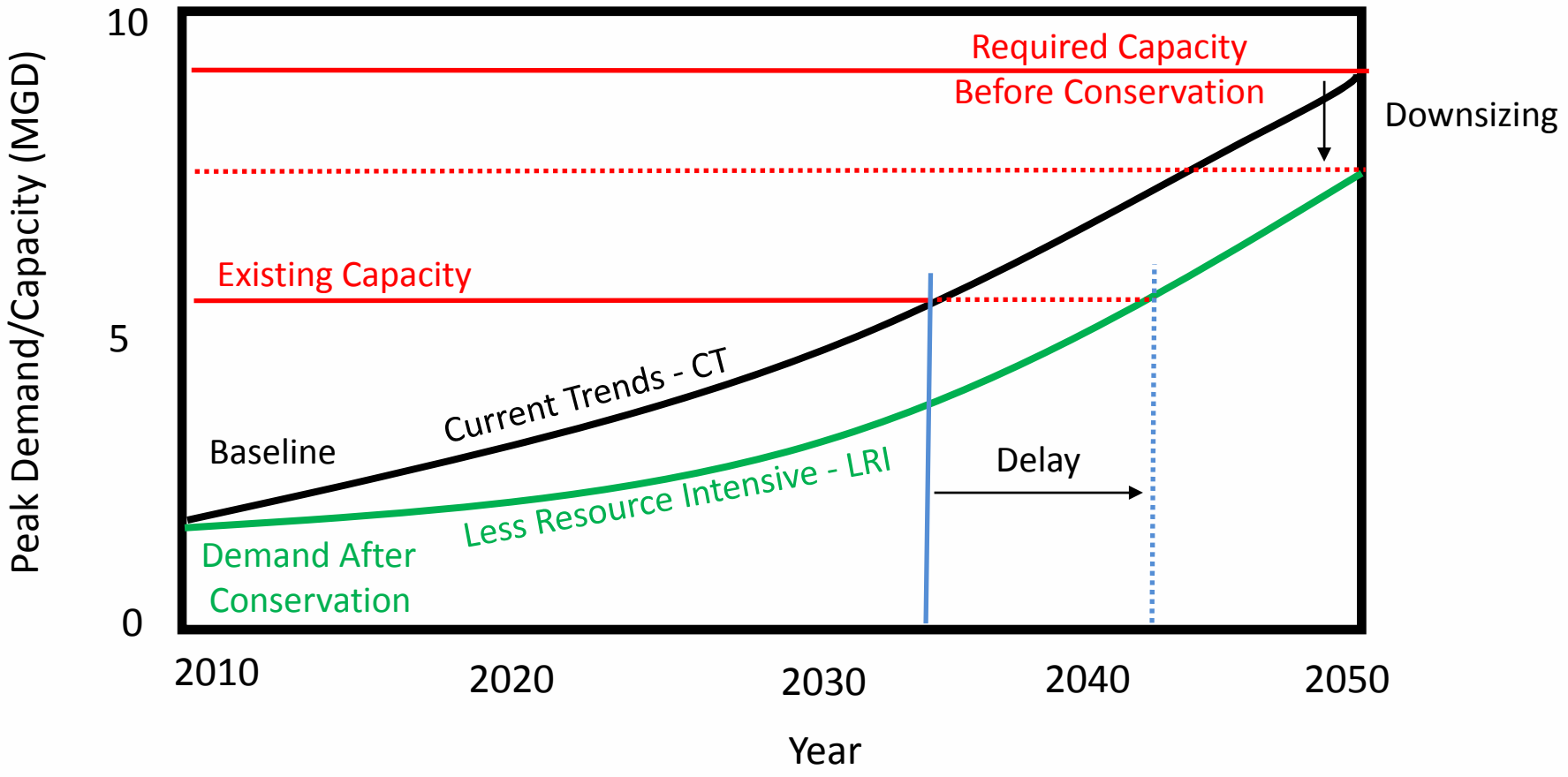
Project Goals

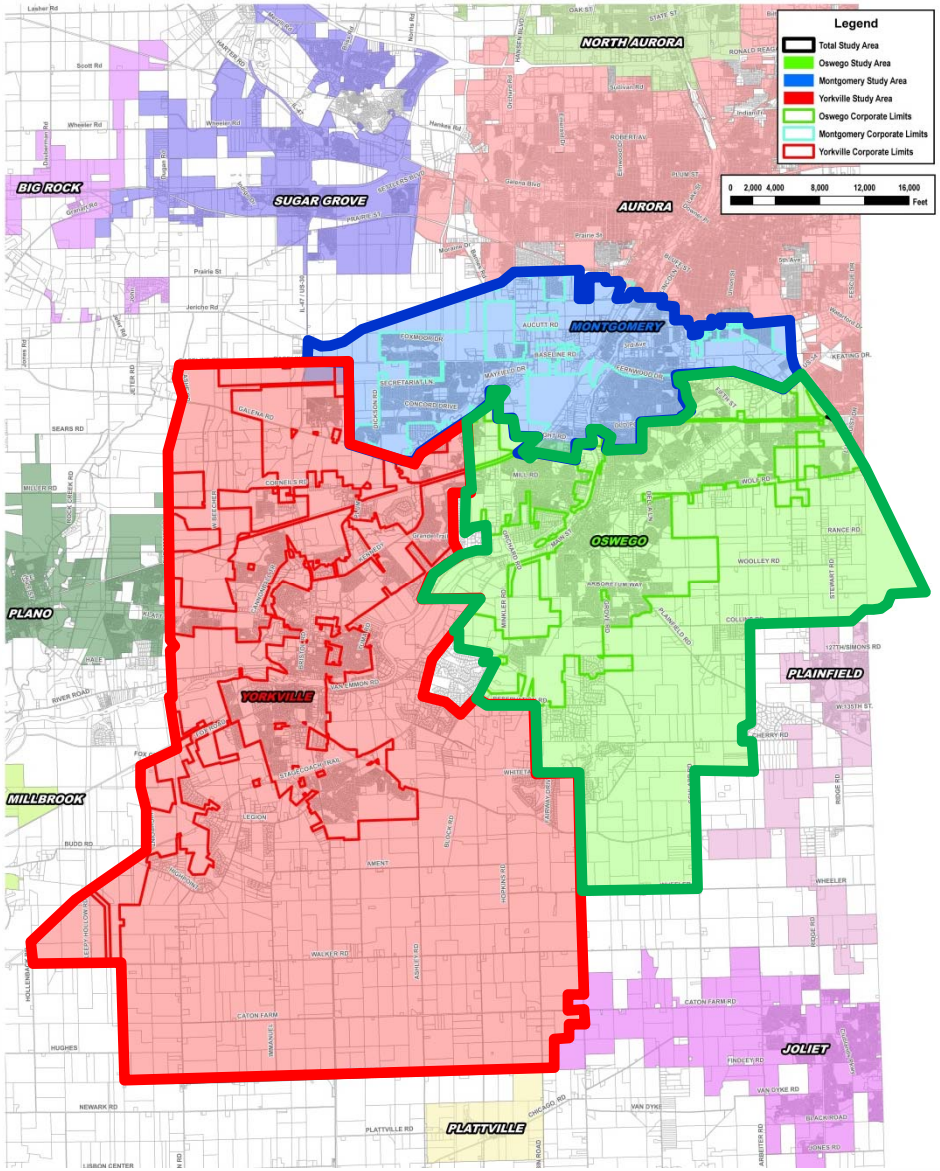
- Initiate sub-regional water supply & treatment discussions between Village of Montgomery, United City of Yorkville and Village of Oswego
- Define population and water use projections for the three communities through 2050
- Evaluate the use of the Fox River as a joint water supply source, along with the appropriate level of treatment, for the three communities
- Develop cost estimates for the proposed improvements
- Develop a potential phasing & implementation plan for the recommended improvements

Background Information

Deferred Capacity Increases Due To Water Use Reduction



Background Information

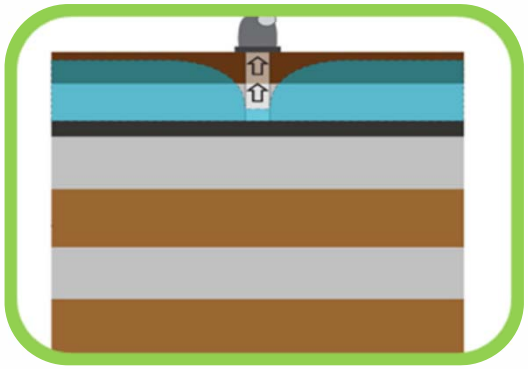


Village of Montgomery
Planning Area: 15.6 sq mi
Ex. Corp. Limits Area: 9.3 sq mi

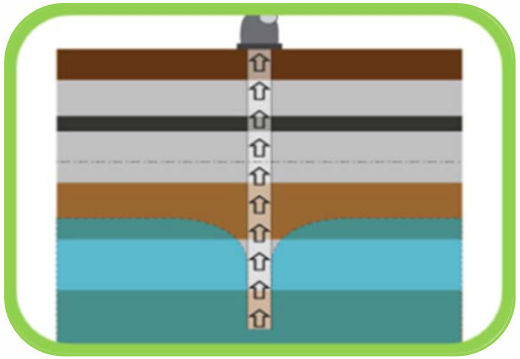
United City of Yorkville
Planning Area: 72.9 sq mi
Ex. Corp. Limits Area: 20.2 sq mi

Village of Oswego
Planning Area: 40.2 sq mi
Ex. Corp. Limits Area: 15.1 sq mi

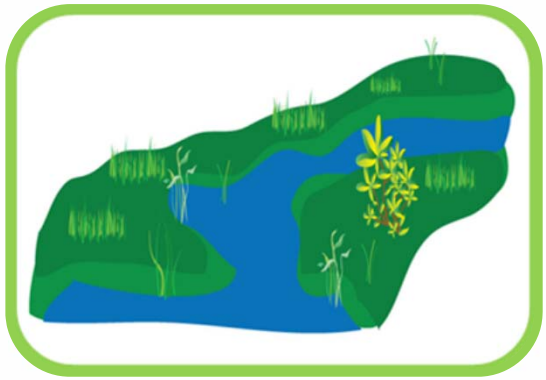
Sustainable Source Water Assessment



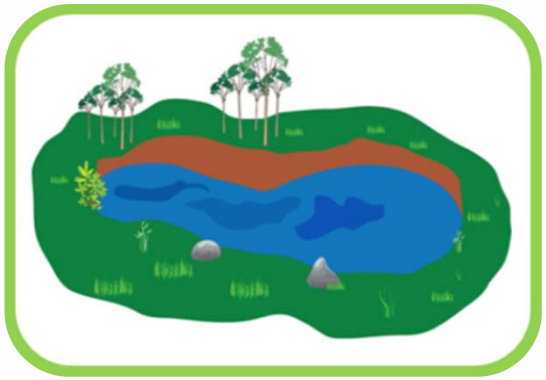
Shallow Sand & Gravel Aquifer



Deep Sandstone Aquifer



Fox River



Lake Michigan

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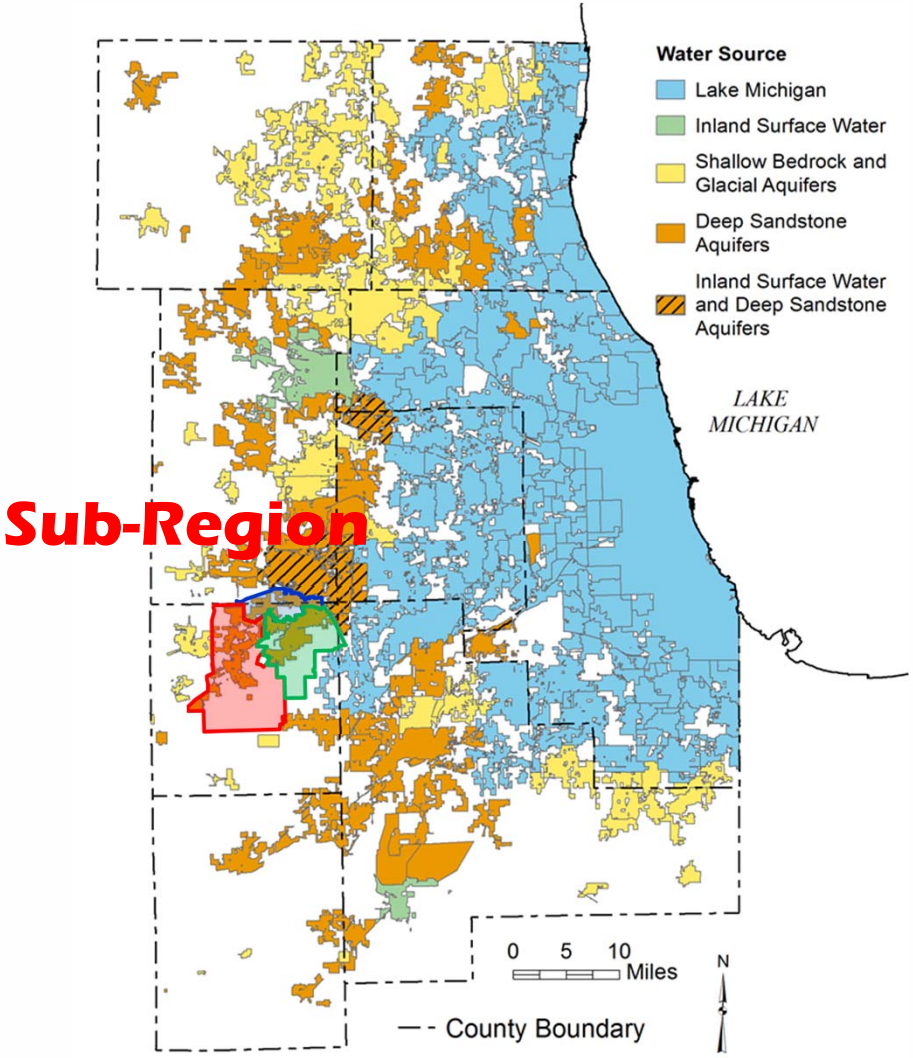
Sustainable Source Water Assessment

- Current Sources of Water in Chicago Region
  - ➔ Most Outer Suburbs Rely on Groundwater
  - ➔ About 90 MGD Being Withdrawn From the Deep Sandstone Aquifers, Which Is At Least 2X the Amount ISWS Estimates Is Sustainable



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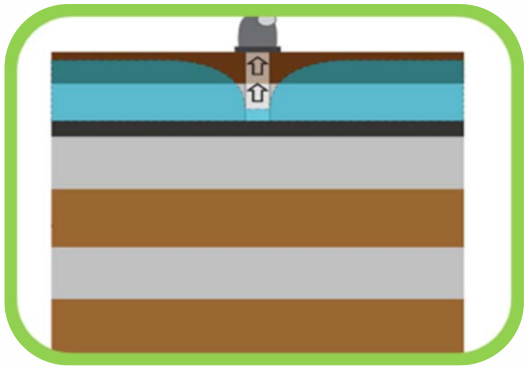

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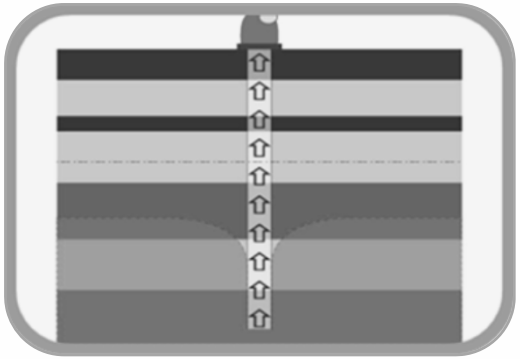

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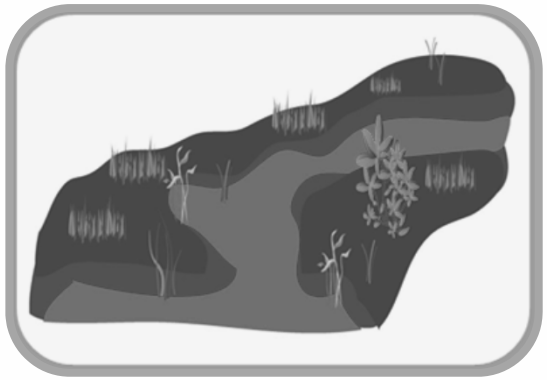

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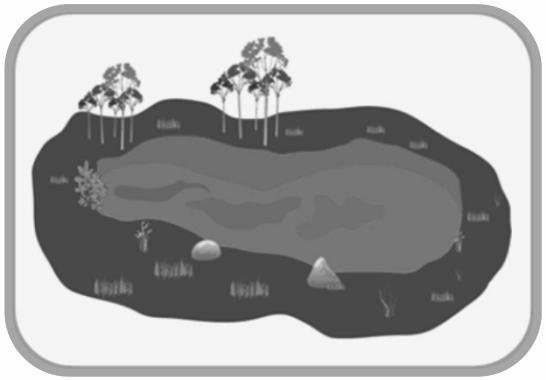

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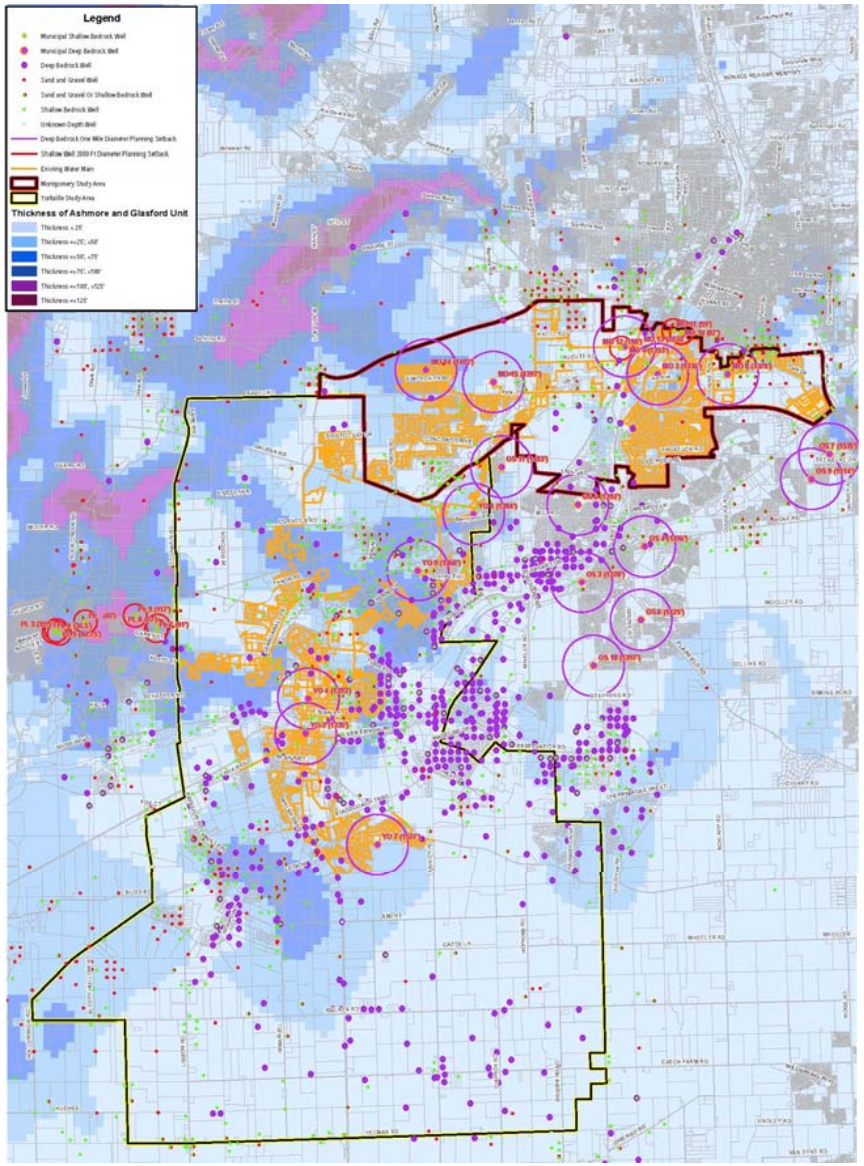
Sustainable Source Water Assessment

- Mapped Wells From ISWS Database
  - ➔ Shallow S&G
  - ➔ Shallow Bedrock
  - ➔ Deep Sandstone
- Mapped Sand & Gravel Formation Thickness
- Insufficient Sand & Gravel Deposits Within Planning Area



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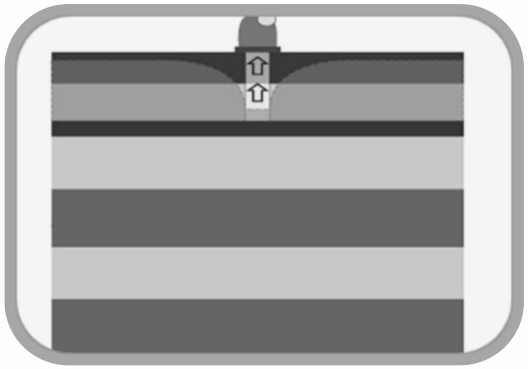

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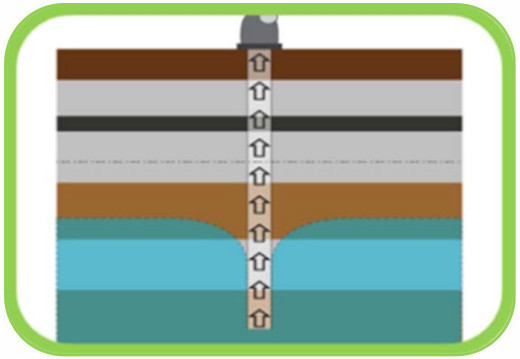

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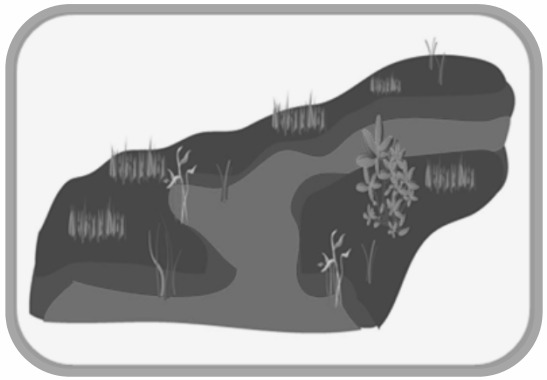

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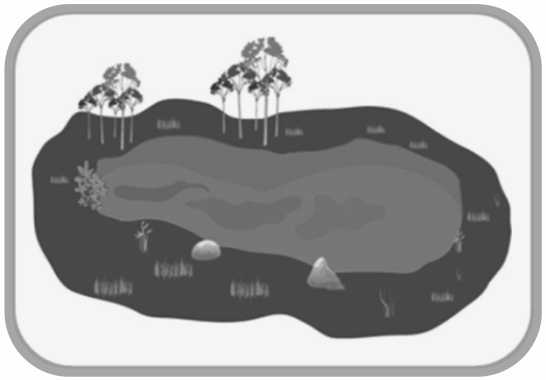

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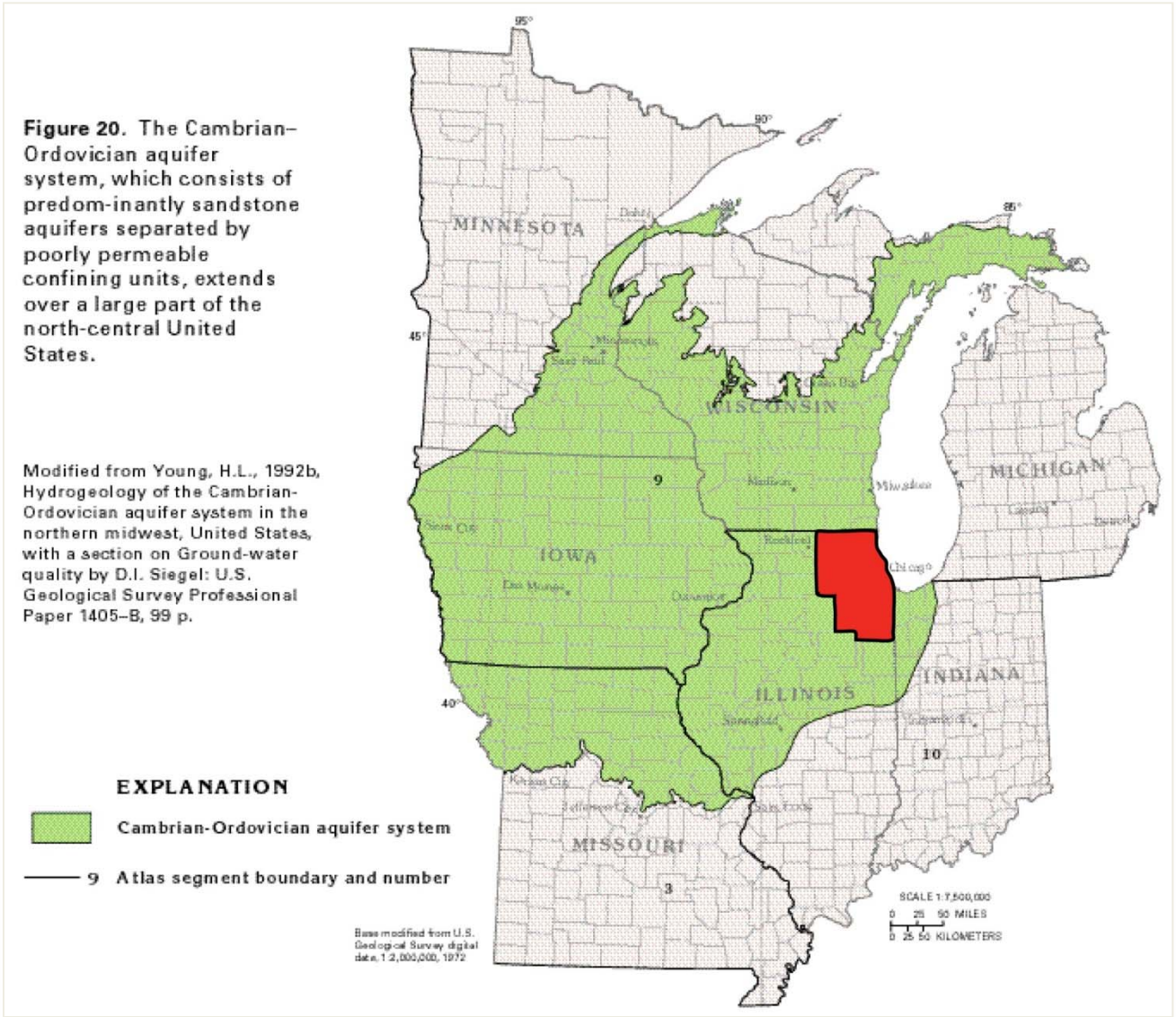


Figure 20. The Cambrian–Ordovician aquifer system, which consists of predom-inantly sandstone aquifers separated by poorly permeable confining units, extends over a large part of the north-central United States.

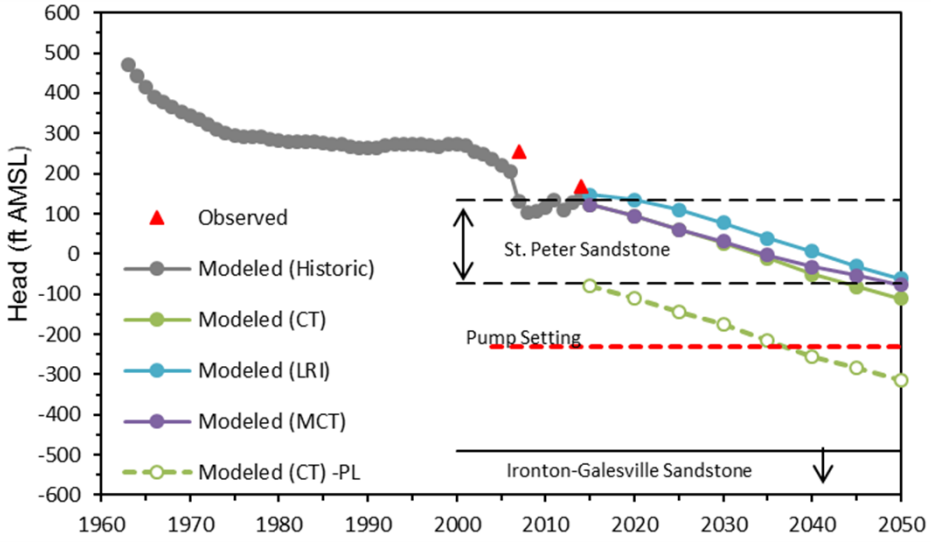
Modified from Young, H.L., 1992b, Hydrogeology of the Cambrian-Ordovician aquifer system in the northern midwest, United States, with a section on Ground-water quality by D.I. Siegel: U.S. Geological Survey Professional Paper 1405–B, 99 p.

Sustainable Source Water Assessment

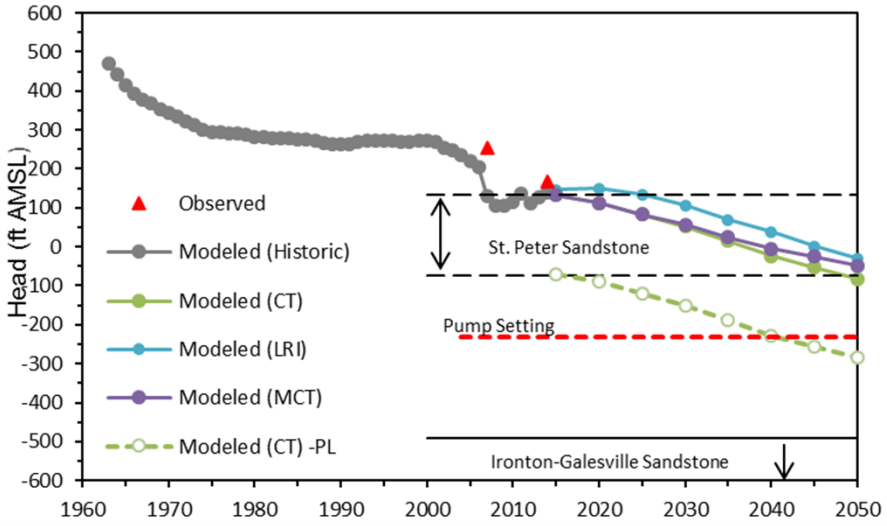
Deep Sandstone Regional Modeling

2050 United City of Yorkville Well No. 9 Water Level Projections

Joliet Remains On Deep Aquifer

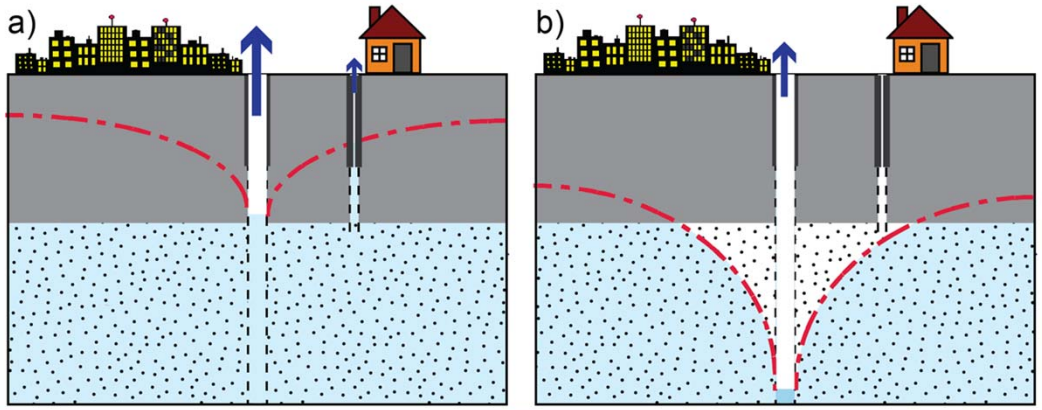


Joliet Switches To Surface Water

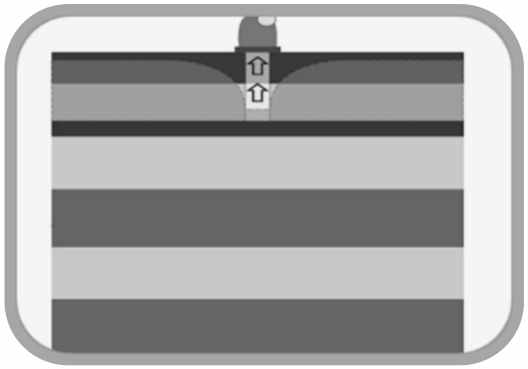


Sustainable Source Water Assessment

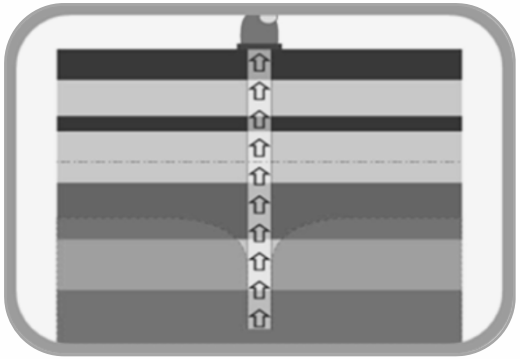
- Additional Challenges With Water Level Declines In Deep Aquifer
  - ➔ Some Industrial & Private Wells Could Go Dry
  - ➔ Lower Water Levels Require Higher Amount of Energy To Pump Water
  - ➔ Flow Rate of Wells Likely To Decline Because of Casing Limitations on Motor Size
  - ➔ Water Quality In Aquifer Likely To Deteriorate; Could Force Additional Treatment
  - ➔ No Back-Up Water Supply For Future



Sustainable Source Water Assessment



Shallow Sand & Gravel Aquifer



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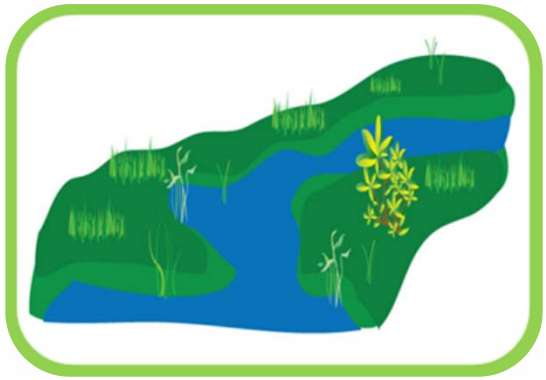
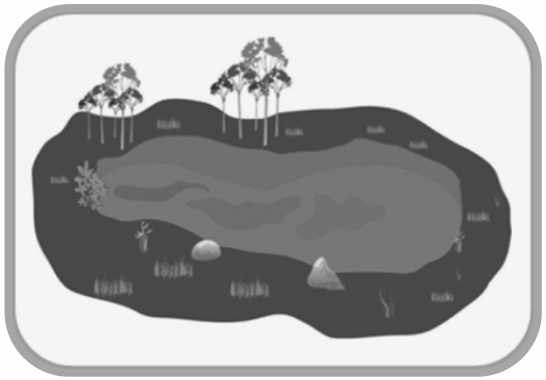


Fox River



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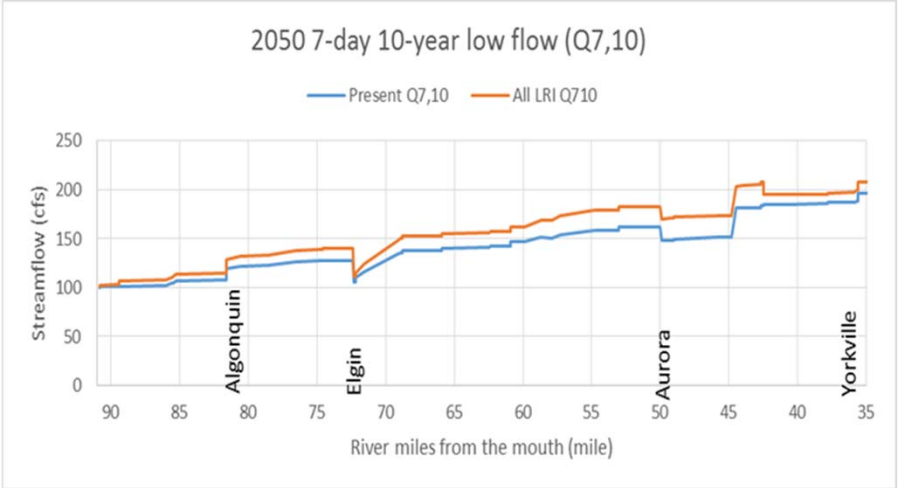
Sustainable Source Water Assessment

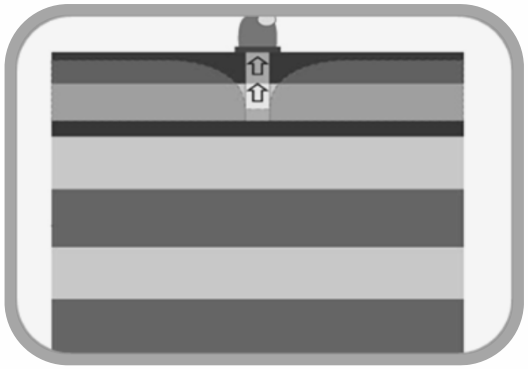
- Fox River
  - ➔ ISWS Ran ILSAM Model To Develop 2050 Fox River Flow Projections
  - ➔ Model Includes Natural & Man-Made Inputs & Withdrawals
  - ➔ Q7,10 Is Typically The State's Protected Low Flow Standard
  - ➔ River Baseflow Projected To Increase In the Future
  - ➔ Most Sustainable Supply Source Within Sub-Region
  - ➔ Back-Up Supply Source Still Needed



Projected Change In Monthly Risk Of River Flow Being Below Current Q7,10 Flow

Month	Current Conditions (%)	2050 Projected Conditions (%)
May	0.4	<0.1
June	0.3	<0.1
July	1.7	<0.1
August	3.6	0.5
September	4.7	0.9
October	2.4	0.7
November	0.4	0.2

Sustainable Source Water Assessment



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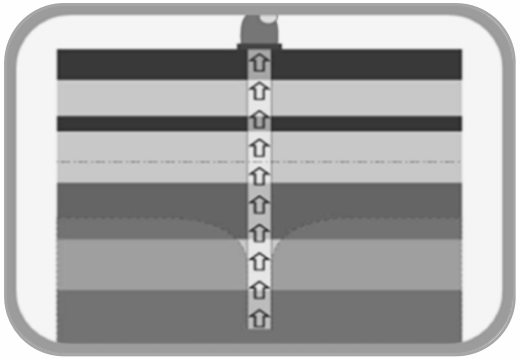

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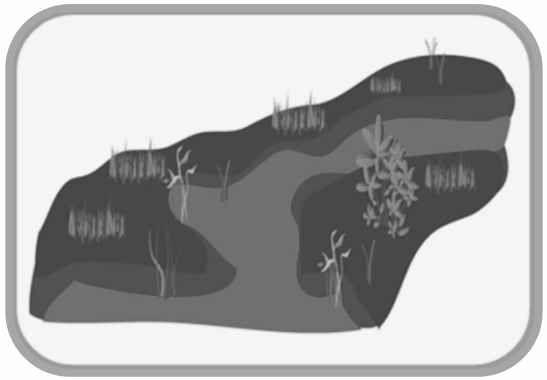

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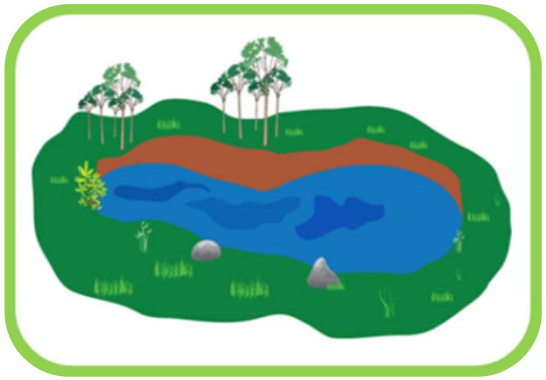

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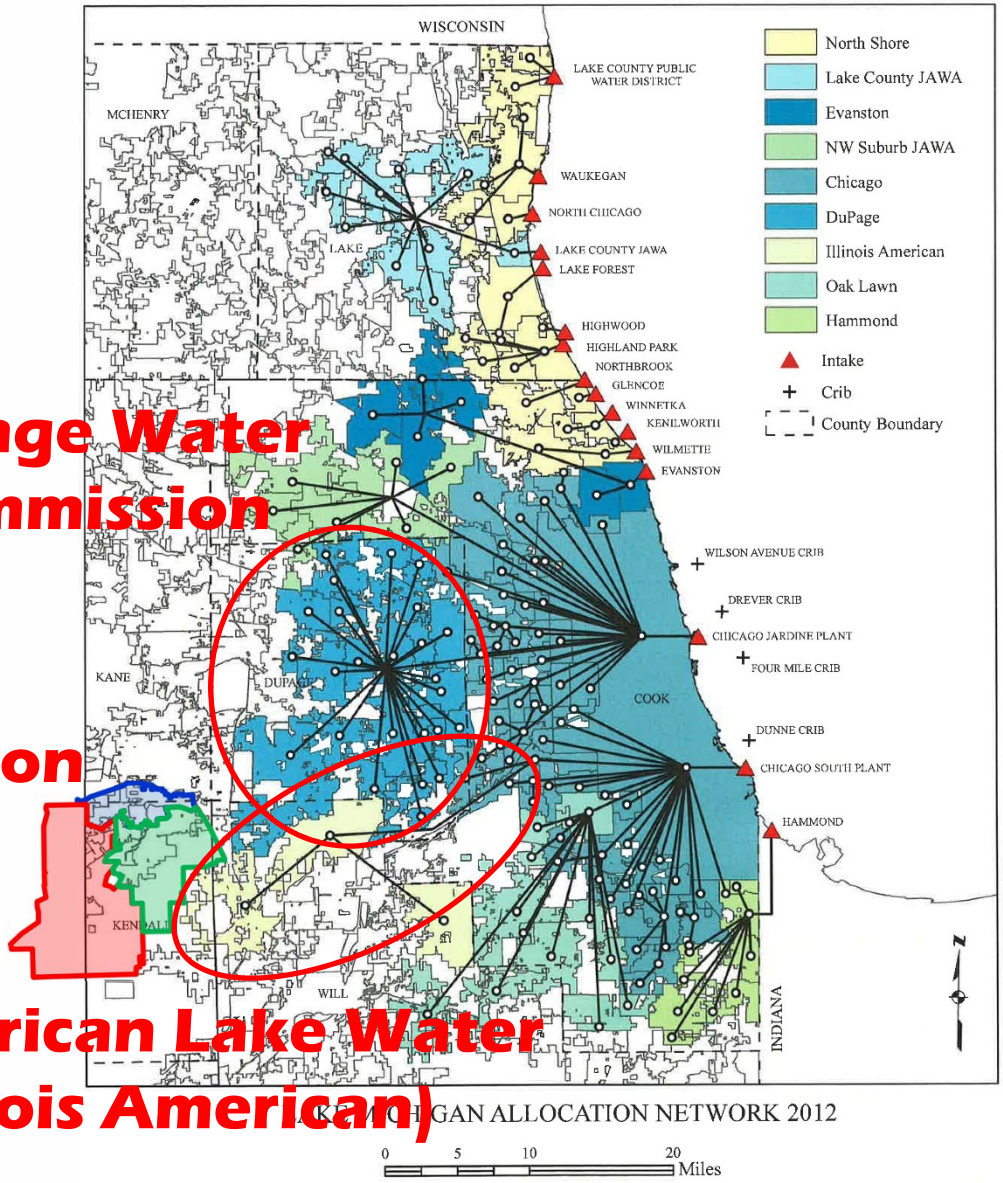
Sustainable Source Water Assessment



DuPage Water Commission

Sub-Region

American Lake Water (Illinois American)

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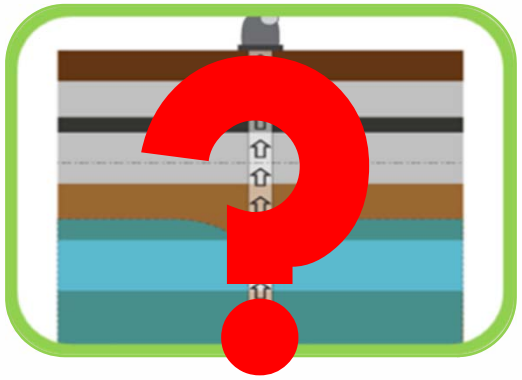
Sustainable Source Water Assessment

Shallow Sand & Gravel Aquifer



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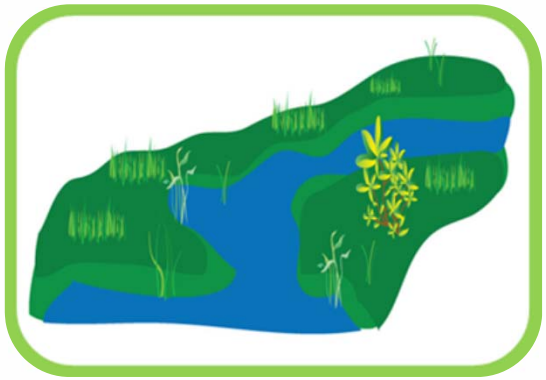


Fox River

Lake Michigan

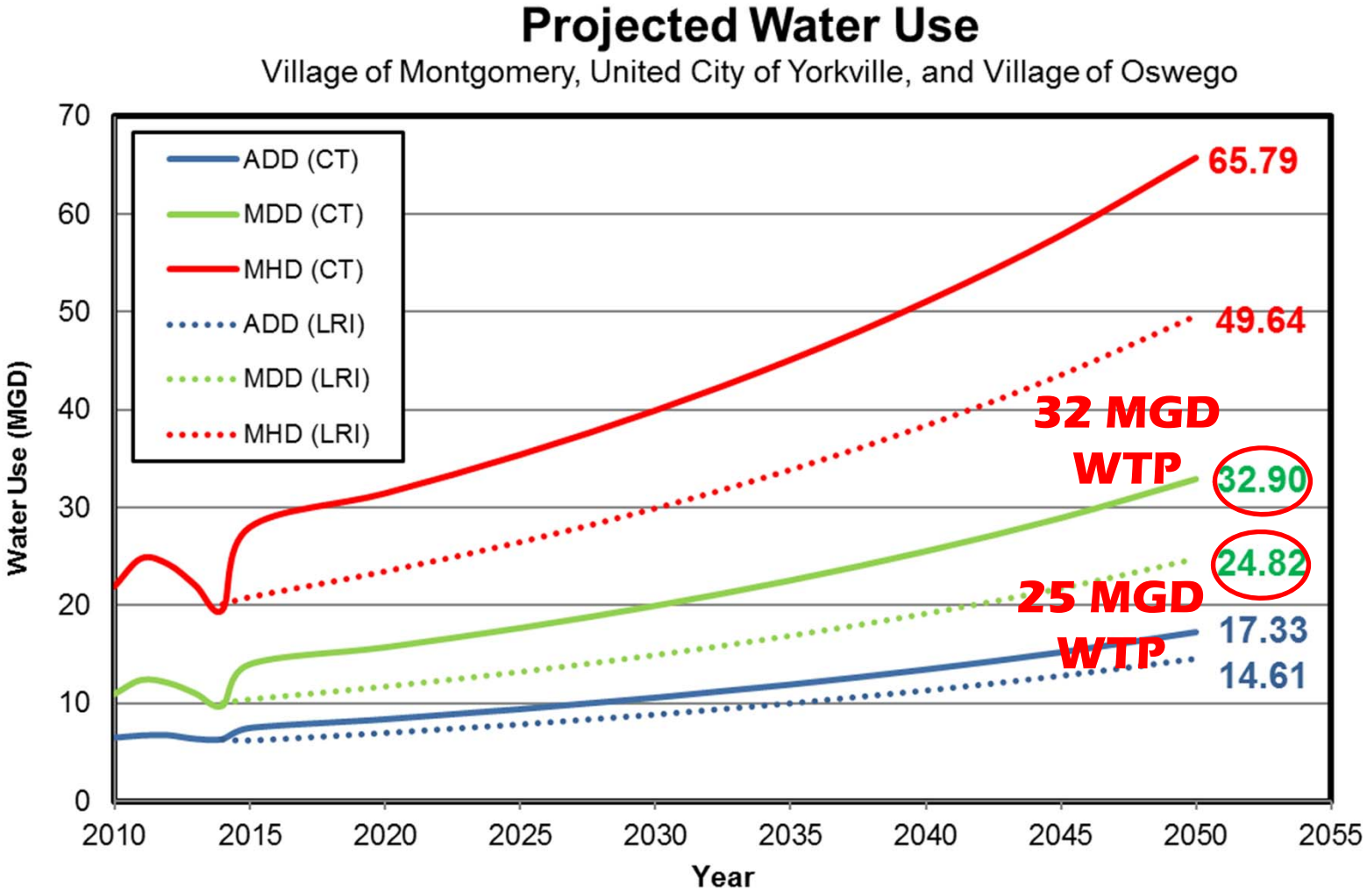
Historical & Projected Water Use

Population Projections

Municipality	Current Population	CMAP 2040 Projection Population	Annual Growth Rate	2050 Population Projection
Montgomery*	28,346	48,688	2.0%	42,000
Yorkville	19,804	43,486	3.2%	59,565
Oswego	34,820	69,155	2.8%	90,996
Total:	82,970	161,329		192,561

* Village of Montgomery buildout population projected to be 32,000 – 33,000; Assumes 9,000 residents in Boulder Hill Subdivision; Maximum total population within planning area estimated to be 42,000.

Historical & Projected Water Use



Historical & Projected Water Use

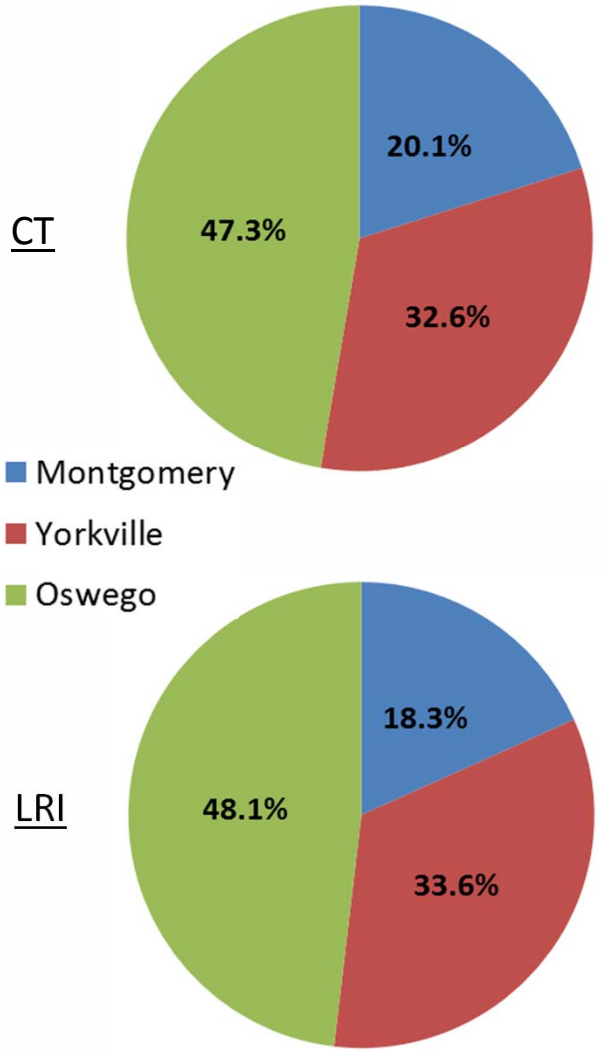
Sub-Region 2050 Water Use Projection Distribution

Parameter	Water Works System			Total
	Montgomery	Yorkville	Oswego	
2050 CT WATER USE PROJECTION				
Average Day Demand				
Value (MGD)	3.78	5.36	8.19	17.33
% of Total	21.8%	30.9%	47.3%	--
Maximum Day Demand				
Value (MGD)	6.62	10.72	15.56	32.90
% of Total	20.1%	32.6%	47.3%	--
2050 LRI WATER USE PROJECTION				
Average Day Demand				
Value (MGD)	3.02	4.77	6.82	14.61
% of Total	20.7%	32.6%	46.7%	--
Maximum Day Demand				
Value (MGD)	4.54	8.34	11.94	24.82
% of Total	18.3%	33.6%	48.1%	--

32 MGD WTP

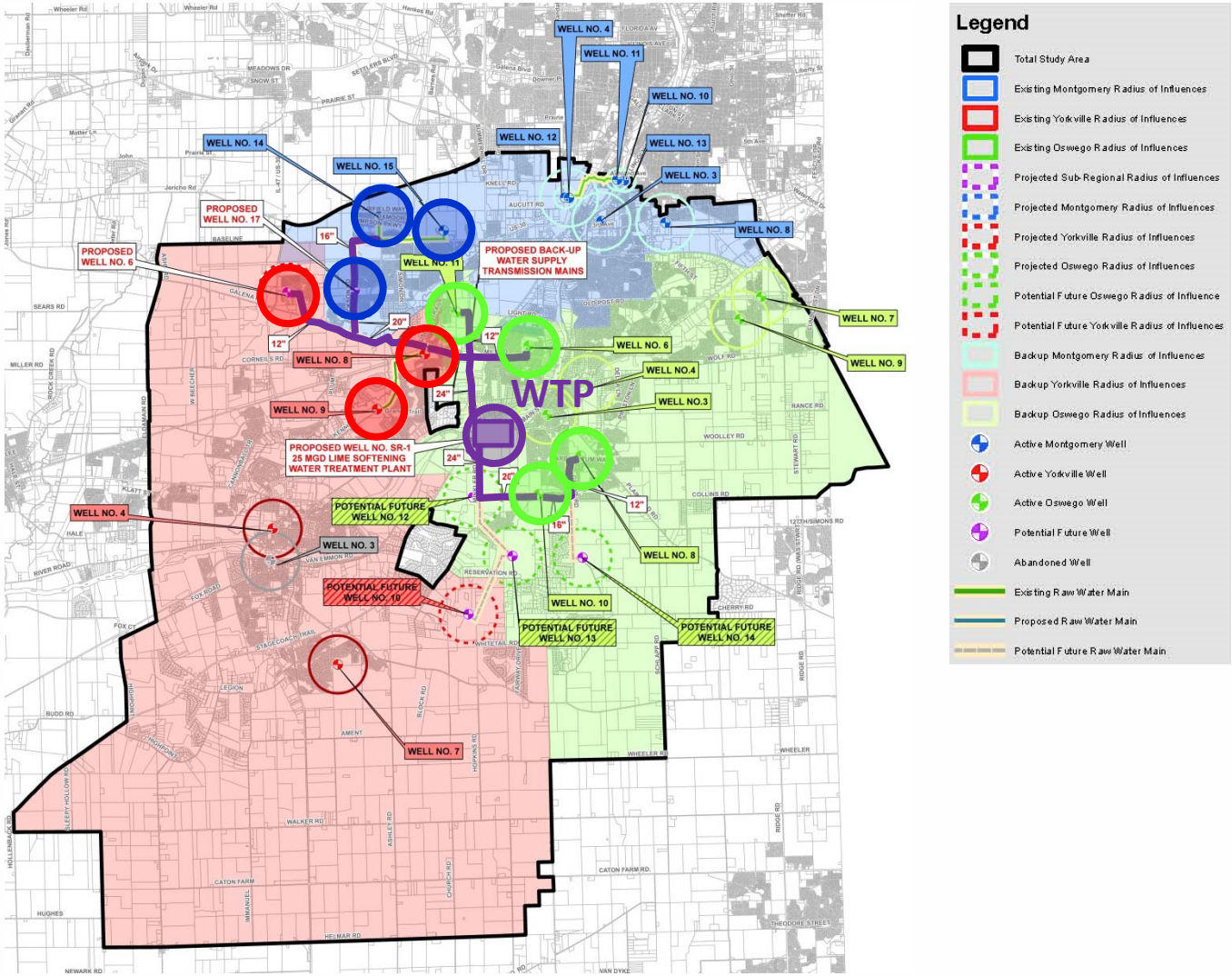
25 MGD WTP

Maximum Day Distribution



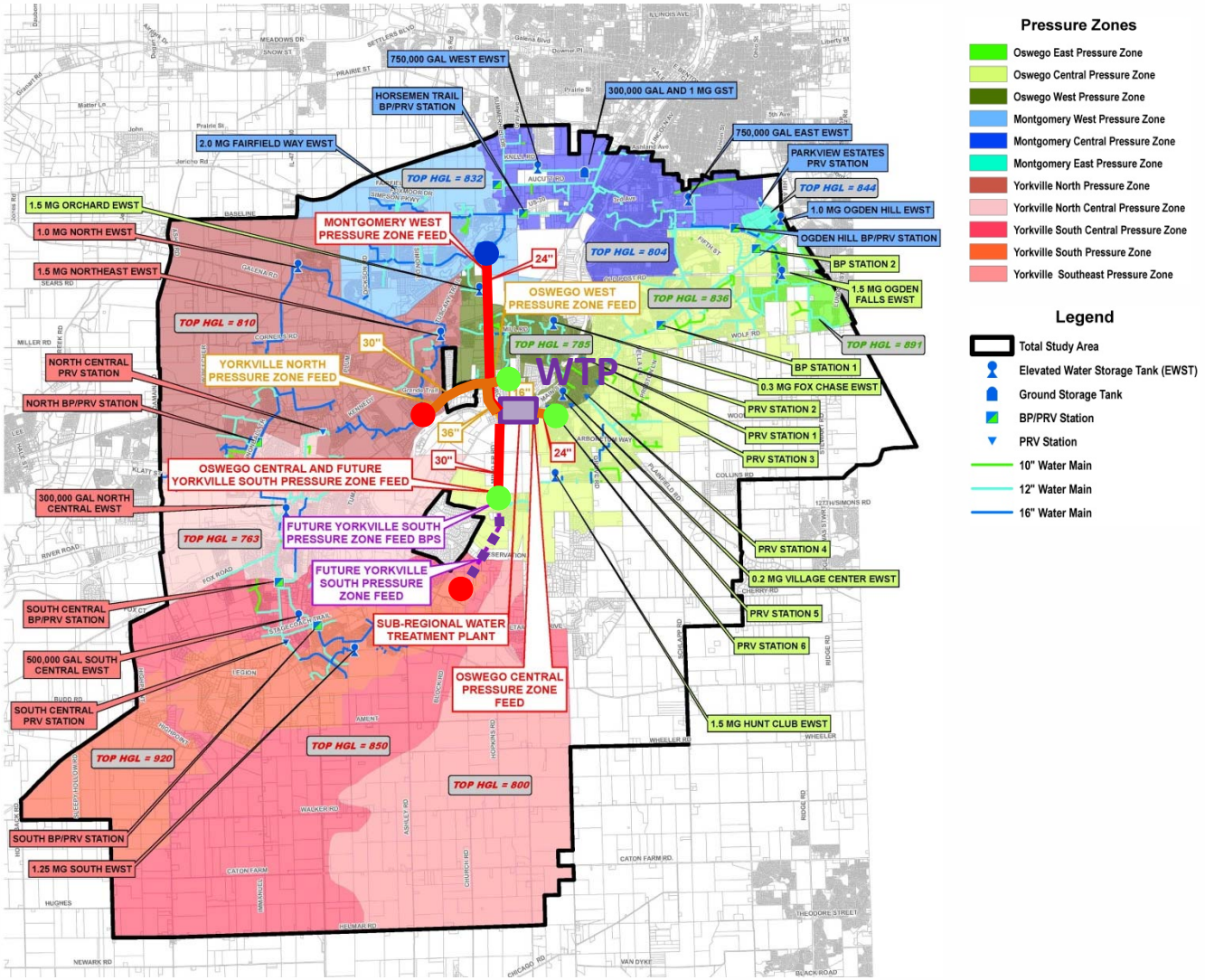
Sub-Regional Analysis

Sub-Regional Back-Up Well Water Supply Plan - LRI



Sub-Regional Analysis

Sub-Regional Treated Water Distribution Plan



Summary & Financial Review

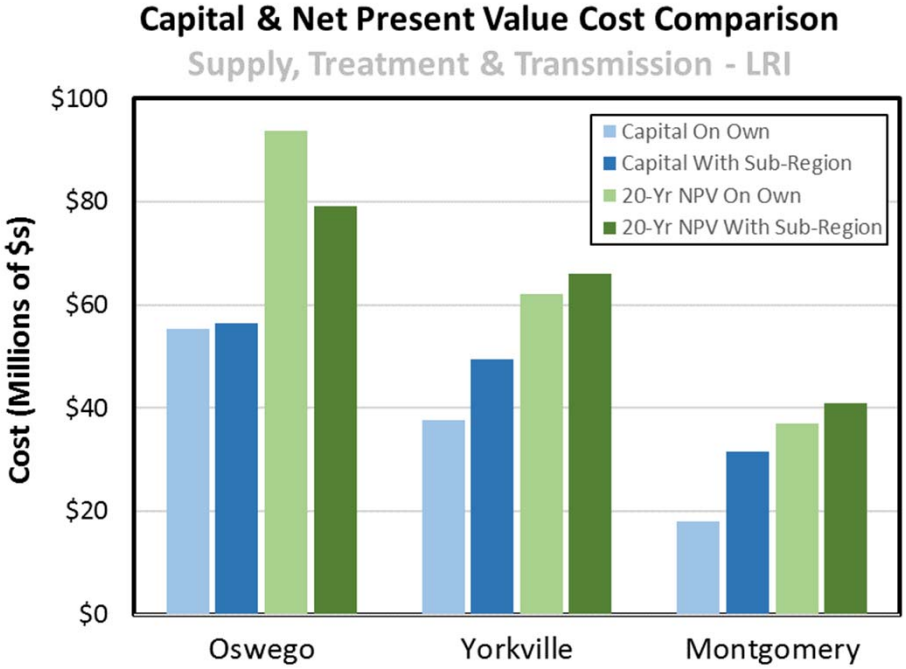
Sub-Regional Capital Cost Distribution - LRI

Village of Montgomery, United City of Yorkville, Village of Oswego

Parameter	Water Works System			Total
	Montgomery	Yorkville	Oswego	
Additional Wells[r]	$2,419,000	$3,133,000	$1,705,000	$7,257,000
Well Transmission Main Network[a]	$5,904,000	$9,298,000	$13,319,000	$28,521,000
Fox River Intake & LSWTP[m]	$13,097,000	$24,047,000	$34,424,000	$71,568,000
Treated Water Transmission Main Network	$10,219,000	$12,990,000	$6,966,000	$30,175,000
Supply & Treatment Subtotal:	$31,639,000	$49,468,000	$56,414,000	$137,521,000
Minimum Internal Distribution System Impr.	$13,565,000	$18,055,000	*	
Total:	**$45,204,000**	**$67,523,000**		

Summary & Financial Review

- Fox River Alternatives Comparison
  - ➔ Two Main Sustainable Long Term Options For Each Community:
    - Construct a Fox River Intake and WTP For Each Community
    - Combine Together To Construct One Intake & WTP (Sub-Regional)
  - ➔ Community Investments
    - Water Supply, Treatment and Transmission Of Treated Water (On Chart)
    - Minimum Internal Water Distribution System Improvements
  - ➔ 20-Year Net Present Value Comparable or Cheaper For Sub-Regional Alternative For All Three Communities



Summary & Financial Review

Potential Sub-Regional Phasing & Implementation Plan

WORK ITEM	YEAR								
	1	2	3	4	5	6	7	8	9
Governance Review	■	■							
Land Acquisition	■	■	■						
Fox River Water Quality Testing		■	■	■					
Water Treatment Plant Component Pilot Testing				■					
Design Engineering				■	■	■			
Project Financing					■	■	■		
Permitting & Bidding						■	■		
Construction							■	■	■

Policy Decisions

- When Is the Right Time To Switch From the Deep Aquifer?
- How Much Should Be Invested In Promoting Water Conservation?
- How Do You Quantify Risks Associated With the Surface Water Supply Source?
- Should the Municipalities Go Alone Or As A Group?
- What Governance Structure Would Be Best For the Group

Additional Q&A

Jeffrey W. Freeman, P.E., CFM, LEED AP

Vice President

jfreeman@eeiweb.com

630-466-6718

Acronyms

ADD = Average Day Demand
BH = Boulder Hill
BPS = Booster Pump Station
CE = Cation Exchange Water Treatment Plant
CT = Current Trends Water Use
EWST = Elevated Water Storage Tank
GPM = Gallons Per Minute
GPCD = Gallon Per Capita Per Day
ISWS = Illinois State Water Survey
LRI = Less Resource Intensive Water Use
LSWTP = Lime Softening Water Treatment Plant
ILSAM = Illinois Streamflow Assessment Model
JAWA = Joint Action Water Agency
MDD = Maximum Day Demand
MG = Million Gallons
MGD = Million Gallons Per Day
MP = Master Plan
NE IL = Northeast Illinois
PRV = Pressure Reducing Valve
Q7,10 = Lowest 7 Day Period of Flow in 10 Years
S&G = Sand and Gravel
SQ = Square Mile
WTP = Water Treatment Plant
WWS = Water Works System